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tion of individuals having opposed characteristics? If the characteristics typically blend in the hybrid offspring, the theory of unit characters loses its main support; but if they typically do not blend, but reappear in the hybrid offspring, each in its pristine purity, then the theory of unit characters is supported and its corollary—evolution by mutation—follows. Hybridization of poultry shows that most characteristics do not blend and do reappear in subsequent hybrid progeny almost unaltered—almost, but not quite.

The Egg-laying of Chironomus annularis:
JAMES G. NEEDHAM, Lake Forest, Ill.

Chironomus annularis, one of the larger midges of wide distribution in Europe and North America, occurs in the campus pond at Lake Forest College, where in May a number of new observations were made as to its manner of oviposition. The eggs are extruded while the female is hanging up among the leaves of the sedges at the water's edge. There occurs a preliminary flight back and forth across the water lasting fifteen to twenty minutes. This flight ends well in-shore, where the female settles and releases the egg masses upon the surface. The egg mass gradually settles beneath the surface, but remains attached to a little transparent float by a slender adhesive gelatinous thread which stretches out to a length of about six inches. The mass then drifts until this suspensory thread comes in contact with some submerged sedge leaf or other solid support, where it remains until hatched. It contains about 1,800 eggs, which hatch in about three days.

Some Notes on the Breeding Habits of our Ithaca Anura: A. H. WRIGHT, Cornell University.

Of the eight local anura, there have been identified the eggs of all in the field and of six in captivity. The mating embrace

has been photographed with all excepting *Rana catesbiana*.

C. JUDSON HERRICK,
Secretary.

SCIENTIFIC BOOKS.

Applied Sociology. By LESTER F. WARD.
Boston, Ginn and Co. 1906.

The clearness, brilliancy and vigorous defense of some pronounced doctrine which we have learned to expect from Professor Ward are characteristic of this book. It concerns real facts, not verbal distinctions; it delights by its cleverness of thought and style; it attempts to rehabilitate a particularly unpromising form of the Leibnitzian theory that proper education can create a millennium.

Very briefly, the argument of the book is as follows: The welfare of people in general (whom I understand the sociologists to mean by the perilous word society) is improvable by the control of inanimate and animate nature, including people themselves, by reason guided by science and ruled by justice. Justice means the satisfaction of every one's wants, so far as they are not outweighed by others' wants. There is reasoning capacity enough in all classes of society. Nature then does not to any degree worthy of consideration limit this control; the cause of weal and woe lies in nurture. The particular error of nurture which people should now reform is the inequality of knowledge; the many suffer because they are ignorant. The equalization of intellect will make happiness for all and will multiply a hundredfold the men and women whose eminent achievements in the sciences and arts free life from undesired labor, fear or sickness and add to it noble impulses and the means to realize them. The equalization of intellect will be secured by giving all knowledge to all men through a proper system of public education.

That the present misery of people in general is due largely to the unequal distribution of knowledge is assumed with little or no discussion of evidence or of the contrary hypothesis that one or two supermen who should next week find cures for cancer, gout and

asthma and an antitoxin against envy, worry and aimless fear, would advance the welfare of people in general more than a year's added schooling to a million of us.

The proposition that nature's limitations need not be considered by the reformer of society divides into two. The first is that though there are among individuals great differences by original nature in the capacity to reason and the capacity to acquire knowledge, there are by original nature no class differences. The evidence offered is an appeal to common experience. In fairness, Professor Ward ought perhaps to have stated that if any class, for instance teachers of science, are selected on the basis of a high standing in these capacities, his statement must soon become erroneous, additionally so if they select wives on the same basis. He has in mind chiefly the classes due to the selective action of interest in and ability to get wealth. In such cases it is hard to disprove his claim, though it would be much harder to prove it. The second division of his general proposition is that which men and how many shall be men of genius whose achievements can be transformed into the improvement of people in general is decided not by the gifts of nature, but by the conditions of nurture, the conditions being the advantages of education. His evidence for this is first a number of facts showing a certain probability that there are a hundred or more men of native ability enough to do the work of genius which only one man in fact now does, and, second, a rehearsal of the results of Odin's '*La Genèse des Grands Hommes*,' which proves that the literary men of France have been born most frequently in châteaux and cities offering educational advantages. He somewhat naïvely takes Odin's facts to mean that 'genius is in things, not men,' disregarding the obvious certainty that if the achievements of men were due to original nature determined by immediate ancestry, we should still find men of achievement born in such cities, because of the certainty that such select and retain those likely on the Galtonian hypothesis to be the ancestors of men of ability. The very high probability of the birth of a man of ability in a château is

perhaps more readily explained by the fact that men of ability come to own châteaux than by any very great educational advantages possessed by these rural homes of aristocracy. Odin's research in fact leaves the whole question of nature *versus* nurture where it was before. The appropriate data are records of children of known differences of ancestry under similar conditions of nurture and of children of known similarities of ancestry under different conditions of nurture. Data of the first sort, so far as obtained, contradict the author's view. Data of the second sort could be obtained without great difficulty in a comparison of the achievements of immigrants' sons brought up till, say, fourteen in a Russian Ghetto with their brothers brought up in the New York City schools.

Proof that education decides which ones or how many shall be leaders in achievement is really not so important to Professor Ward's general plea for 'all knowledge for all men' as it seems to be in his pages. There are, of course, two ways of viewing a man's achievement, as to its absolute amount and as to its amount in comparison with the achievements of his contemporaries. The former quality is the one of importance to people in general; the latter is the one by which a man gains eminence. No one doubts that the former is due largely to the environment; with the backing of a modern education I may make a discovery which Aristotle could never have made. The latter may be due almost entirely to the gifts of original nature and these may deny the world more than one Aristotle a century, and still the value of universal and advanced education may be extreme. The one failure in clearness of this volume is its failure to distinguish between absolute and relative achievement and to assign the proper social value to each. Professor Ward seems to think that a great desideratum is the elevation of several thousands a generation from mediocrity to eminence, but one is tempted to believe that his real faith is in absolute achievement and that he courageously makes an attack upon the Galtonian hypothesis because he misconceives it to limit absolute as well as relative achievement.

One may even abandon hope of and desire for the equalization of intellect and still keep the essence of Professor Ward's optimism. For every one of the desirable consequences of the equalization of intellect may be gained as well, if not better, by the same amount of effort and wisdom directed toward its *increase*. Space is lacking for me to defend this somewhat rash amendment, which the author would probably repudiate.

EDWARD L. THORNDIKE.

TEACHERS COLLEGE, COLUMBIA UNIVERSITY.

Geometrische Kristallographie. By ERNST SOMMERFELDT, Privatdozent an der Universität. Tübingen. Pp. vi + 139, 31 plates and 69 text figures. Leipzig, W. Engelmann. 1906.

This is a book intended for advanced students of crystallography, written from the standpoint of the mathematician. Specifically limiting himself to the purely geometrical properties of crystal solids, the author develops his theme from the definitions of symmetry and in the first chapters defines the thirty-two recognized classes of crystals distinguished by varying grades of symmetry. These groups are variously classified and admirably illustrated by the plates which give for each of the classes the possible crystal forms and show very graphically the relations between them. In the following chapters the mathematical relations existing between the faces of the crystal are deduced and the fundamental crystallographic laws are stated. The mathematical processes, particularly vector analysis and the properties of determinants, which are chiefly involved are made the subject of a special chapter and their treatment is stated by the author to be original and to have an interest quite aside from the application to the problems of this work.

To the student actually engaged in the measurement and study of crystals the book offers little of practical interest except in the presentation of formulæ for the transformation of indices and axes which are here developed in very general form.

CHARLES PALACHE.

SCIENTIFIC JOURNALS AND ARTICLES.

THE contents of the *American Journal of Science* for September are as follows:

R. A. DALY: 'Abyssal Igneous Injection as a Causal Condition and as an Effect of Mountain-building.'

W. E. FORD: 'Some Interesting Beryl Crystals and their Associations.'

F. E. WRIGHT: 'Schistosity by Crystallization: A Qualitative Proof.'

M. R. CAMPBELL: 'Fractured Boulders in Conglomerate.'

E. L. FURLONG: 'Exploration of Samwel Cave.'

T. L. WATSON: 'Occurrences of Unakite in a New Locality in Virginia.'

E. H. SELLARDS: 'Types of Permian Insects.'

R. H. ASHLEY: 'Analysis of Dithionic Acid and the Dithionates.'

The American Journal of Anatomy, Vol. V., No. 4, September 1, 1906, contains the following articles:

R. B. BEAN: 'Some Racial Peculiarities of the Negro Brain.' (With 8 tables, 16 figures and 12 charts.)

F. P. MALL: 'On Ossification Centers in Human Embryos.' (With 6 tables and 6 figures.)

J. L. BREMER: 'Description of a 4 mm. Human Embryo.' (With 16 figures.)

CHARLES R. STOCKARD: 'The Development of the Mouth and Gills in *Bdellostoma*.' (With 36 figures.)

THE July number of the *Journal of Mathematics* contains the following articles:

EDWARD KASNER: 'The Geometry of Differential Elements of the Second Order with respect to the Group of all Point Transformations.'

F. J. B. CORDEIRO: 'Gyroscopes and Cyclones.'

W. A. MANNING: 'On the Primitive Groups of Class Ten.'

VIRGIL SNYDER: 'On Certain Unicursal Twisted Curves.'

HENRY LIVINGSTON COAR: 'Functions of Three Real Independent Variables.'

DISCUSSION AND CORRESPONDENCE.

THE NATURE AND ORIGIN OF VOLCANIC HEAT.

IN *SCIENCE* for August 10 Dr. Elihu Thomson gives a theory of volcanic energy which he correctly describes as an extension of the ideas of Mallet. Having been recently much occupied with the theory of volcanoes in con-